Franchisees' Financial Constraints and Franchisors' Franchising Decisions

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Abstract

We study how the financial constraints of agents affect the behavior of principals in the context of franchising. We develop an empirical model of franchising, simultaneously considering the effect of franchisees' financial constraints on chain growth but also on the decision about when to begin franchising. We estimate the model by combining data on franchised chains and data on local macroeconomic conditions. In particular, we use collateralizable housing wealth at the state level as an inverse measure of the average financial constraints of potential franchisees. We first measure how much collateralizable housing wealth affects franchisors's franchising decision. We find that a decrease in collateralizable housing wealth in the local economy leads to both later entry into franchising by franchisors, and slower growth in the number of franchised outlets in the chains. We show that the corresponding job losses can be substantial.

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1 Introduction

The recent collapse of debt financing has been touted as a major factor affecting the viability and growth of small and large businesses alike (see e.g. Schweitzer and Shane (2010). [1] It has also been described in the press as a major factor affecting the development and growth of franchised chains in particular (see for example Reuteman (2009)).

The idea that franchisors are attracted to franchising because it allows them to obtain financing, i.e. that they need franchisees to have access to capital, has always been a major theme for participants in the industry and scholars interested in franchising.[2] However, the fact that older and large firms with access to capital markets continue to rely on franchising has cast some doubt on the idea that access to franchisee capital is a main reason for firms to franchise. Moreover, authors as far back as Rubin (1978) have pointed out that the undiversified nature of the franchisee's investment should make them a particularly costly source of finance for franchisors as franchisees will require a higher return rate on their capital when they invest in a single establishment in the chain rather than investing in a portfolio of establishments at the chain level.[3]

Despite these problems with the simple financing argument, the fact remains that most franchisors, including established franchisors, require that their franchisees provide significant portions of the capital needed to open their franchise. While some – especially newer franchisors – still emphasize their desire for capital as a reason to do so, others describe the need for franchisees to have a stake in the game as a main reason to require high franchisee investment levels. In other words, franchisors value the incentive effect arising from the fact that their franchisees have their life savings and home tied to the success of the business. But once one recognizes the need for franchisees to bring capital to the business for franchisee incentive purposes, the financial constraints that franchisees face can become a constraint on franchise chain growth and affect the value of franchising to these chains as well. In other words, if franchisees having a stake in the business is central to their incentives, and if franchisees in a particular region do not have enough collateral to put forth, chains will have no choice but to slow down or forgo growth via franchising in that region.

In this paper, we develop a simple agency model that emphasizes the role of borrowing and franchisee collateral in the provision of franchisee incentives. We then set up an empirical model of franchising that explicitly takes into account the effect of the financial constraints of potential franchisees. In the empirical model, a chain decides on when to start franchising as well as how best to expand, i.e. via what combination of company-owned outlets and franchised outlets, once it begins franchising. Specifically, at the beginning of each period, the chain decides whether to pay a

[1] There is much theoretical and empirical work on the importance of capital constraints for firm growth and survival. For example, see Clementi and Hopenhayn, 2006 and the references therein.

[2] See for example Oxenfeldt and Kelly (1969), and Caves and Murphy II (1976).

[3] See also Brickley, Dark and Weisbach (1991) and Norton (1995) on these issues.

sunk cost to become a franchise chain. During the period, it is randomly and continuously presented with opportunities to expand by establishing new outlets. If it remains a corporate entity, which most of these firms do for a few years before they start franchising, it can only exploit opportunities as company-owned outlets. In other words, it either opens a company-owned outlet or lets go of the opportunity. If, however, it has entered into franchising at some earlier time, it now can open either a franchisee-owned or a company-owned outlet when an opportunity arrives (or again let go of the opportunity). Chains for which a franchised outlet is more likely to generate higher profit than a company-owned outlet therefore tend to enter into franchising earlier and expand relatively faster through franchised outlets.

We estimate the determinants of the relative profitability of a franchised outlet (relative to a company-owned outlet) as well as the distribution of the sunk cost and the opportunity arrival process using data on more than 900 chains between 1984 and 2006. We combine these data with other information about local macroeconomic conditions. In particular, we use collateralizable housing wealth measured at the state level to capture the average financial constraints of potential franchisees in that state. If collateralizable wealth increases, we argue that it becomes easier for chains to find a franchisee with sufficient collateralizable wealth, and this affects the likelihood that it becomes optimal to open a franchised outlet. Intuitively, the more a franchisee can put down as collateral to borrow in order to start her business, the greater her incentives to work hard, and hence the greater the profitability of franchising to a chain.

The estimation results confirm the above intuition. According to our estimates, when franchisees' financial constraints are more binding, which we model using a 30% decrease in the collateralizable housing wealth of potential franchisees, chains open relatively fewer franchised, and hence also fewer total, outlets. Specifically, we find that the number of total outlets of chains five years after they start in business decreases by 2.24 on average. The average decrease in the number of total outlets ten years after a chain start in business is 3.41. Combined with Census Bureau information about the importance of franchising in the U.S. economy, our results suggest that such a decrease in access to financing for franchisees could affect as many as 174,000 to 245,000 jobs.

This paper contributes first and foremost to the empirical literature on contract theory. Much of this literature has focused on agrarian markets (e.g. Laffont and Matoussi (1995), Ackerberg and Botticini (2002), Bandiera (2001), Dubois (2002); see Chiappori and Salanié (2002) for a survey) or franchising (Brickley and Dark (1987), Lafontaine (1992), Lafontaine and Shaw (2005); see Lafontaine and Slade (2007) for a survey). In this literature, authors usually regress contract types on principal and agent characteristics such as riskiness and agent risk aversion. We highlight the importance of agents' financial constraints on contract form.[4] Specifically, we emphasize the role

[4]Laffont and Matoussi (1995) also emphasize the role of financial constraints in an agrarian context. In their model, when a tenant is financially constrained, it is impossible for her to sign a contract that offers a high share of output because such contracts also require a high upfront rental fee.

of franchisees' collateral and examine the effect of this constraint on the decision of franchisors to franchise or operate establishments corporately.

This paper also relates to a new literature in macroeconomics on deleveraging, which considers how a decline in home equity borrowing can lead to a recession (e.g. Philippon and Midrigan (2011), Guerrieri and Lorenzoni (2011), Eggertsson and Krugman (2012), Mian and Sufi (2012)). In these papers, tighter borrowing constraints lead to a decline in aggregate demand and eventually a recession. We highlight a different channel through which decreased collateralizable housing values can affect economic growth and jobs. In our paper, a decrease in collateralizable housing wealth makes a potential franchisee unattractive to a chain by decreasing the power of incentives. As a result, fewer stores are opened and fewer jobs are created. We highlight this channel in our counterfactual simulations by varying the collateralizable housing wealth while holding other macroeconomic variables such as per-capita gross state product (GSP) constant.

Finally, our paper contributes to an emerging literature that explicitly accounts for the endogeneity of market structure and its implication for firm behavior explicitly. For example, Roberts and Sweeting (2011) studies auctions with selective entry. In such auctions, potential buyers with higher values are more likely to participate. Because of selective entry, they find that a sequential mechanism tends to produce higher revenues. In our paper, we study chain stores' expansion through franchised or company-owned outlets. We define potential entrants into franchising as chains that have already started in business and developed their business format. Similar to Roberts and Sweeting (2011), we take the set of potential entrants as exogenous. (See also Scott Morton (2000) and Fan and Xiao (2012)). We find that chains for which a franchised outlet is likely to be more profitable than a company-owned outlet, and hence chains that can grow relatively faster through franchised outlets, are more likely to enter into franchising earlier as well. It is therefore important to consider this endogeneity in studying the expansion of chains.

The rest of the paper is organized as follows. In the next section, Section 2, we describe a simple incentive model emphasizing the effect of franchisee investment from an incentive perspective, and we derive implications from the model. We describe the data in Section 3. Section 4 presents the empirical model. The estimation results are explained in Section 5. Section 6 presents the results of a counterfactual simulation where we study how tighter financial constraints of potential franchisees influence the franchising decision of a chain. Finally, Section 7 concludes.

2 Conceptual Framework

In this section, we briefly describe how franchisees' financial constraints can affect chains' franchising decisions. In Appendix A, we present a more formal model. In this simple model, franchisee effort and the profitability of franchised outlets depend on how much collateral a franchisee is able to put up. If the franchisor is not able to find a potential franchisee with sufficient collateralizable

wealth, it can only expand via company ownership.

Suppose that the revenue for any specific chain outlet is increasing in the effort that the manager of the outlet puts forth. Of course, the revenue also depends on the concept or business format, on the local conditions for that specific outlet, and a random term, which makes it impossible for the firm to infer manager effort from revenue. Because the manager is salaried – or has low-powered incentives – we assume that the effort that can be induced for an employed manager is inefficient, i.e. the marginal revenue from more effort is larger than the marginal cost of more effort. Thus, there is value to inducing more effort than in a managerial unit, such that opening a franchisee-owned outlet – i.e. using a higher-powered incentive contract – may be efficient.

Now consider a franchised outlet. The potential franchisee has collateralizable wealth W which we assume to be held mostly in the form of housing. We assume that this wealth is generally not sufficient to fully collateralize the debt so a bank will face default risk. The franchisee and the banks sign a contract specifying the repayment and the collateral. Based on the contract, the franchisee decides on the amount of effort to exert. In the appendix, we show that Bertrand competition among banks leads to an equilibrium contract that requires that the franchisee put up her entire collateralizable wealth as collateral. Since the franchisee's incentive to exert effort is increasing in the collateral she puts down, the effort and profits of the franchisee are strictly increasing in her collateralizable wealth. This in turn implies that for large enough collateralizable wealth, the franchisor makes strictly greater profits opening a franchisee-owned outlet than a company-owned outlet.

For empirical purposes we do not observe the wealth constraints of the particular potential franchisee that the franchisor will have access to for a specific opportunity of opening an outlet. However, if a shock in a given region generally reduces housing wealth and thus collateralizable wealth, the franchisor should be less likely to find a franchisee with sufficient collateralizable wealth to make it worthwhile to open up a franchisee owned outlet. While we will not observe the collateral available for any given outlet opening, we know that if the distribution is shifted we should see an impact on the likelihood of a new outlet being franchisee or company-owned. Moreover, we should see a decrease in the likelihood that a chain will choose to enter franchising soon after it starts in business. These are the main predictions from the model that we take to data below.

3 Data

3.1 Data Sources and Variable Definitions

Our data on franchised chains, or franchisors, are from various issues of the Entrepreneur magazine's "Annual Franchise 500" surveys and the yearly "Source Book of Franchise Opportunities," now called Bond's Franchise Guide. Together, these sources provide information on 800 to 900 U.S.

franchised chains each year from 1980 through 2006, except for 1999 and 2002, when the data were not collected. For each franchisor that appears at least once in the data, we observe when the chain first started in business and when it started franchising, where the difference between the two is what we refer to as the waiting time. For example, if a chain starts franchising in the same year that it goes into business, the waiting time variable is simply 0. In addition, we observe the U.S. State where each chain is headquartered, its business activity, and the amount of capital required to open an outlet (Capital Required).[5] If a chain is present in our data in 1993 or later, we have information about the number of employees that the typical outlet needs (Number of Employees).[6] Finally, for each year when a franchised chain is present in the data, we also observe the number of company-owned outlets and the number of franchised outlets. These two variables describe a chain's growth pattern.

We calculate the Capital to Labor ratio for each chain as the ratio of the amount of Capital Required to the Number of Employees. Because of the central role of the store manager in overseeing labor locally, agency-theoretic arguments for franchising suggest that the Capital to Labor ratio should have a negative effect on the value of franchising – i.e. the value, to the chain, of making the local manager a residual claimant should be greater if production is more labor intensive. We also expect differences in the type of business activity to affect the value of franchising for the chains. We therefore divide the chains among six "sectors" according to their business activity: 1- the set of firms that sell to other businesses rather than end consumers (Business Products and Services), 2- restaurants and fast-food (Restaurants), 3- home maintenance and related services, where the service provider visits the consumer at home (Home Services), 4- services consumed at the place of business of the service provider, such as health and fitness, or beauty salons (Go To Services), 5- the set of firms that sell car-related products and repair services (Auto Products and Services), and 6- retail stores (Retail).[7]

Our main explanatory variable of interest, however, is a measure of franchisee collateralizable wealth. We construct this variable by combining information from several sources. First, we obtained data on a yearly housing price index at the state level from the Federal Housing Finance

[5]We transform the latter variable to constant 1982-84 dollars using the Consumer Price Index.

[6]We count part-time employees as equivalent to 0.5 of a full-time employee. Note that the Capital Required and Number of Employees needed to run the business are intrinsically determined by the nature of the business, which itself is intrinsically connected to the brand name. As such, these characteristics should not change from year to year. Yet we find some variation in the data. We use the average across all the observations we have for these two variables for each franchised chain under the presumption that most of the differences over time reflect noise in the data. There is also some variation in the reported years in which the firm begins franchising and when it starts in business. For these variables, we use the earliest date given because we see that franchisors sometimes revise these dates to more current values for reasons we do not fully understand. However, we make sure that the year of first franchising is after the first year in business. We also push the year of franchising to later if we have data indicating no franchised establishments in the years when the firm states it is franchising.

[7]Note that we exclude hotel chains from our data because we have too few of them, and the type of services they offer cannot easily be grouped with the categories we use. Moreover, in this industry, firms use a third contractual form, namely Management Contracts, in addition to franchising and company ownership.

Agency.[8] We used these data, along with data on housing values by state in 1980 (the base year of the aforementioned housing price index),[9] also from the Census Bureau, to generate time series of yearly housing values per state. Second, we obtained yearly data about home ownership rates across states from the Census Bureau.[10] Finally, we obtained data from the joint Census-Housing and Urban Development (HUD) biennial reports based on the American Housing Surveys, which summarize information on mortgages on a regional basis (Northeast, Midwest, South and West). Specifically, from this source, we obtained measures of regional housing values, total outstanding principal amount, and number of houses owned free and clear of any mortgage.[11] We use these data to calculate the average proportion of mortgage outstanding for homeowners in the region each year.[12] Since the reports are biennial, we ascribe the value to the year of, and the year before, the report. As the first report was published in 1985, this implies that the data we needed to generate our main variable of interest begins in 1984.[13] We then combine this information on the proportion of outstanding mortgage for homeowners with the state home ownership rate and housing value time series to calculate our measure of Collateralizable Housing Wealth, given by: (one minus the average proportion of mortgage still owed) multiplied by the home ownership rate and by housing value for each state/year.

3.2 Linking Chain-Level and State-Level Data

We combine the data on chains with our state/year collateralizable wealth and other yearly state-level macroeconomic data, namely data on the local level of economic activity, i.e. Gross State Product (GSP), which we obtain from the Bureau of Economic Analysis. We use the Consumer Price Index data from the Bureau of Labor Statistics to generate a measure of real annual GSP. We obtained yearly state population estimates data from the Census Bureau and use this to create a measure of Per Capita Real GSP.[14]

Our goal, with these variables, is to capture the environment within which the chain is likely

[8]These data apparently are revised at the source quite frequently, perhaps as often as every time a new quarter is added. It also has been moved around several web sites. The version used here is the "States through 2010Q3 (Not Seasonally Adjusted) [TXT/CSV]" series in the All-Transactions Indexes section at http://www.fhfa.gov/Default.aspx?Page=87. The base period of the index is 1980Q1.

[9]These values are reported in constant year 2000 dollars. We transform them to constant 1983-84 based constant dollars using the Consumer Price Index.

[10]See U.S. Census Bureau, Housing and Household Economic Statistics Division.

[11]These can be found in Tables 3-14 and 3-15 of the biennial reports. The data for housing values and for total outstanding principal are reported in the form of frequencies for ranges of values. We use the middle value for each range and the frequencies to calculate expected values for these.

[12]Specifically, this variable is calculated as: $\frac{(TOPA*NTOPA)}{(NTOPA+NF)}$, where TOPA is Total Outstanding Principal Amount, NTOPA is the Number of Households that Reported Outstanding Principal, and NF is the Number of Households with Houses owned Free and Clear of any mortgage.

[13]The regional data is ascribed to all states in each region.

[14]The population data were downloaded from: http://www.census.gov/popest/states/.

to expand. Since we do not observe where they seek franchisees, we use information about where we see chains typically expand and information at the state level to measure the conditions that the chain likely faces. Most franchisors expand first in their state of headquarters and then move on to establish outlets in other, often nearby, states. We can confirm this tendency in our data because franchisors report the state where they operate the most outlets. We use this information – for the latest year at which we observe a chain, but before year 15 after they start franchising, as we are trying to capture expansion patterns for relatively young franchised chains – to construct a square matrix, the element (i, j) of which is the percentage of franchisors in our data that are headquartered in state i and report state j as the state where they have the most outlets. The resulting matrix, in Appendix B, confirms that most franchisors operate most of their outlets in the state where they are headquartered. This can be seen by the fact that the diagonal elements are fairly large, typically larger than any off diagonal element. However, holding the state of origin constant and looking along a row in this matrix, it is also clear that franchisors headquartered in certain, typically smaller states, view some other, usually nearby, states as good candidates to expand into. For example, 25% of the franchisors from Nevada have more outlets in California than in any other state. Only 13% of them report having more outlets in Nevada than anywhere else. Similarly, many franchisors headquartered in Utah (48% of them) have expanded into California to a greater extent than they have in their own state. Only 36% of them have most of their establishments in Utah proper.

We interpret this matrix as an indication of where franchisors from each state are most likely to want to expand. We therefore use the elements of this matrix, along a row – i.e. given a state of headquarters – to match our state/year-level macroeconomic variables with the relevant chain-or chain/year variables.

Because we are interested in how the chains grow and how long they wait, after starting in business, until they begin franchising, we need to observe the macroeconomic conditions that each firm faces from the time it starts its business. Since the data for collateralizable wealth is only available from 1984 onward, we must restrict our analyses to franchisors that started in business from that year on. Unfortunately, this reduces our sample of franchisors substantially, from 4342 across all survey years, down to 1344 US-based franchisors. This also means that well-known and established brands such as McDonald's and Burger King, established in the 1950s, are excluded from our analyses. An advantage that arises from this restriction, however, is that our theory presumes that franchising is an option for the firms in our data from the time they start their business. And given that franchising was still relatively new, it might be that chains that started in business in the 50s and 60s did not know about or consider franchising as a viable option at that time. After eliminating also franchised chains for which we have missing data on employment or capital required, and hotel chains, we are left with a data set of 4450 yearly observations on 1018 separate franchised chains. Finally, we delete observations for 56 outlier franchisors who either grow

very fast (the number of outlets increases by more than 100 in a year) or shrink very fast (more than half of the existing outlets exit in a year). Our final sample then consists of 4031 observations and 962 franchisors headquartered in 48 states, and that started in business in 1984 or later.

3.3 Summary Statistics and Basic Data Patterns

Summary statistics for all our variables are presented in Table 1. They show that most of the firms in our data waited only a few years after starting in business to become involved in franchising, with an average of only 3 years between the two. The majority of the chains in our data also are relatively small, and they rely on franchising a lot, given a mean number of franchised outlets at 45, and a mean number of company owned outlets of only 4. They also are not very capital intensive, not surprisingly. Finally, the franchisors in our data are distributed relatively evenly across all the aggregate sectors we defined, with Auto Products and Services the least populated of our sectors.

Table 1: Summary Statistics

	Mean	Median	St. Dev.	Min	Max	Obs
Waiting Time (years)	3.12	2	3.15	0	18	962[a]
Company-owned Outlets	3.95	1	14.92	0	415	4031[b]
Franchised Outlets	45.12	20	67.55	0	582	4031
Required Employees	5.58	3.50	7.67	0.50	112.50	962
Required Capital (constant 82-84 $00000)	0.98	0.54	2.33	0	57.64	962
Business Products & Services	0.12	0	0.33	0	1	962
Home Services	0.14	0	0.35	0	1	962
Go to Services	0.21	0	0.41	0	1	962
Auto Products & Services	0.07	0	0.26	0	1	962
Restaurants	0.21	0	0.41	0	1	962
Retail	0.25	0	0.43	0	1	962
Coll. Housing Wealth (82-84 $10K)	5.51	4.86	2.62	2.39	28.57	1104[c]
Population (million)	9.16	8.68	5.41	0.52	32.03	1104
Per-capita Gross State Product (82-84 $10B)	1.89	1.80	0.62	1.22	7.47	1104

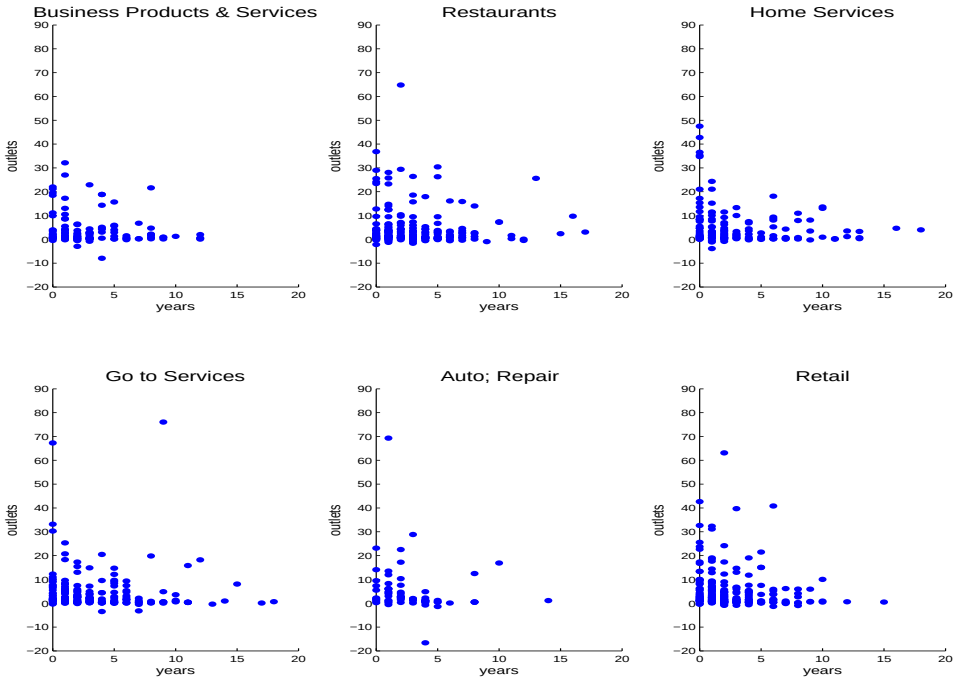
[a] At the chain level
[b] At the chain/year level
[c] At the state/year level, for 48 states between 1984 and 2006.

Figure 1 shows the overall growth in number of outlets. For each chain, we compute the yearly change in the total number of outlets (including both company-owned outlets and franchised outlets).[15] In the figure, we include each chain only once, by taking the average of the calculated

[15] When the data on the number of outlets is missing for all chains, as in, for example, 1999, we compute the change

yearly growth in number of outlets over the years we observe each chain. We show this average yearly growth in number of outlets against the chain's waiting time (i.e. the number of years between when it starts in business and when it begins franchising). Figure 1 shows that chains that enter into franchising faster also grow faster on average. This is true for chains in all sectors.

Figure 1: Entry and Growth by Sector (Average Yearly Growth in Total Outlets and Waiting Time before Franchising)



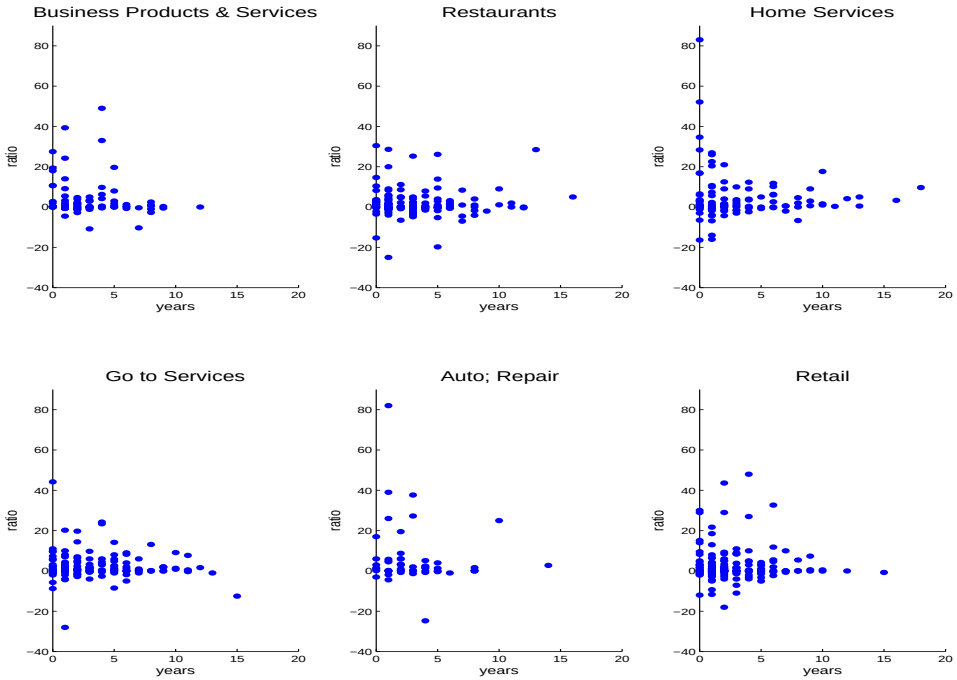
Similarly, we show the relative growth in the number of franchised outlets in Figure 2. In this figure, for each chain, we compute the yearly change in the number of franchised outlets and the yearly change in the number of company-owned outlets separately, and then we average the yearly ratios of these two over time.[16] Figure 2 shows that chains that start franchising faster not only grow faster overall (per Figure 1) but also grow relatively faster through franchised outlets. This is quite intuitive. Firms make decisions on entry based on their expectations of growth after entry. In the context of franchising, a chain with a business model that is particularly suitable for franchising and that has a lot of opportunities to open outlets probably starts franchising earlier. Given these

in number of outlets from 1998 to 2000 and divide the result by 2 to compute the yearly change.

[16]When there is no change in the number of company-owned outlets between two years, we replace the ratio by the change in number of franchised outlets, thereby treating the number of company outlets as if it has increased by 1, to avoid division by 0.

data patterns, in Section 4, we set up a model that simultaneously addresses chain growth and the timing of entry into franchising (i.e. Waiting Time).

Figure 2: Entry and Relative Growth by Sector (Average Ratio of Growth in Franchised Outlets to Growth in Company-owned Outlets and Waiting Time before Franchising)



4 Empirical Model

In this section, we set up an empirical model to explain both the timing of when a chain starts franchising and how it grows through company-owned and franchised outlets. The owner of a chain that has not yet begun franchising makes two decisions in the model. First, at the beginning of each year, she decides whether to pay the sunk cost to start franchising. The start of franchising is costly because franchisors must develop operating manuals, contracts, disclosure documents – to abide by the Federal Trade Commission (FTC) disclosure requirements, and those of the many states that have such rules as well if the firm plans to expand in any of those – and processes to support and control franchisees when they become involved in franchising. The business owner must devote significant amounts of time to these activities, in addition to relying on lawyers and

accountants, and they risk affecting the existing business adversely in the process.[17] And none of these costs are recoverable if the firm decides to stop franchising.

The second decision that a business owner makes during the course of a year is what to do when opportunities to open an outlet arise. Given any opportunity, the business owner who has not become involved in franchising yet has two options: she can decide to set up a company-owned outlet or she can give up the opportunity. If she has already incurred the costs of developing her franchise system, she has the additional option of developing the opportunity as a franchised outlet. Since the decision on entry into franchising depends on future decisions regarding growth, we first describe how we model the latter.

We assume that opportunities to open an outlet arrive exogenously, and their arrival follows a Poisson process with rate m_{it} for chain i in year t, where $m_{it} = exp(x_{it}^{(m)}\beta_m + \nu_i)$ and ν_i's are i.i.d. and follow a normal distribution with mean m and variance σ_m^2. The variable $x_{it}^{(m)}$ is the logarithm of population, which captures market size, and is expected to affect the number of opportunities a chain gets during a year. When an opportunity τ arrives in year t after chain i has started franchising, as mentioned above, the owner can choose to open a company-owned outlet, a franchised outlet or pass on the opportunity. The relative attractiveness of these options depends on chain-specific characteristics such as its industry and the labor intensity of the production process. It also depends on chain/year-specific variables such as the tightness of credit constraints of its potential franchisee pool. Specifically, we assume that the value of a company-owned outlet and that of a franchised outlet are, respectively

$$\begin{aligned} \pi_{ci\tau} &= \boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + u_{ci} + \varepsilon_{ci\tau}, \\ \pi_{fi\tau} &= \pi_{ci\tau} + \boldsymbol{x}_{it}^{(f)}\boldsymbol{\beta}_f + u_{fi} + \varepsilon_{fi\tau}, \end{aligned} \tag{1}$$

where $\boldsymbol{x}_{it}^{(c)}$ is a vector of observable chain- or chain/year-specific variables that affect the profitability of opening an outlet, $\boldsymbol{x}_{it}^{(f)}$ consists of the observables that influence the relative profiability of a franchised outlet, and $u_i = (u_{ci}, u_{fi})$ captures the unobserved profitability of a company-owned and a franchised outlet. The error terms $\varepsilon_{ci\tau}$ and $\varepsilon_{fi\tau}$ capture the unobserved factors that affect the profitability of an outlet given opportunity τ. We assume that $\varepsilon_{ci\tau} = \epsilon_{ci\tau} - \epsilon_{0i\tau}$ and $\varepsilon_{fi\tau} = \epsilon_{fi\tau} - \epsilon_{ci\tau}$, and that $(\epsilon_{ci\tau}, \epsilon_{fi\tau}, \epsilon_{0i\tau})$ are i.i.d. and drawn from a type-1 extreme value distribution. Let $\boldsymbol{x}_{it} = \left(\boldsymbol{x}_{it}^{(m)}, \boldsymbol{x}_{it}^{(c)}, \boldsymbol{x}_{it}^{(f)}\right)$. Therefore, the probability that chain i opens a company-owned outlet conditional on the arrival of an opportunity is

$$p_{ac}\left(\boldsymbol{x}_{it}, u_i\right) = \frac{\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + u_{ci}\right)}{\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + u_{ci}\right) + \exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + u_{ci} + \boldsymbol{x}_{it}^{(f)}\boldsymbol{\beta}_f + u_{fi}\right) + 1}, \tag{2}$$

[17] There is also the option of hiring a specialized consulting firm to help with this process. Hiring such firms easily costs \$100,000 to \$200,000, or more. These are substantial amounts for most of the retail and small-scale service firms in our data.

where the subscript a stands for "after" (after starting franchising) and the subscript c represents "company-owned". Similarly, the probability of opening a franchised outlet conditional on the arrival of an opportunity is

$$p_{af}\left(\boldsymbol{x}_{it}, u_i\right) = \frac{\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + u_{ci} + \boldsymbol{x}_{it}^{(f)}\boldsymbol{\beta}_f + u_{fi}\right)}{\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + u_{ci}\right) + \exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + u_{ci} + \boldsymbol{x}_{it}^{(f)}\boldsymbol{\beta}_f + u_{fi}\right) + 1}. \tag{3}$$

If, however, chain i has not started franchising by year t, the probability of opening a company-owned outlet conditional on the arrival of an opportunity is

$$p_{bc}\left(\boldsymbol{x}_{it}, u_i\right) = \frac{\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + u_{ci}\right)}{\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + u_{ci}\right) + 1}, \tag{4}$$

where the subscript b stands for "before" (before starting franchising).

Given that the opportunity arrival process follows a Poisson distribution with rate m_{it} for chain i in year t, the number of new company-owned outlets opened in year t before chain i starts franchising follows a Poisson distribution with mean $m_{it}p_{bc}\left(\boldsymbol{x}_{it}, u_i\right)$. Similarly, the number of new company-owned outlets opened after chain i starts franchising follows a Poisson distribution with mean $m_{it}p_{ac}\left(\boldsymbol{x}_{it}, u_i\right)$; and the number of new franchised outlets has mean $m_{it}p_{af}\left(\boldsymbol{x}_{it}, u_i\right)$. Note that we cannot separately identify the opportunity arrival rate and the overall profitability of opening an outlet. For example, when we observe that a chain opens a small number of outlets per year, we do not know whether this is because the chain had only a few opportunities during the year, or because it decided to take only a small proportion of a large number of opportunities. Therefore, we normalize u_{ci} to be 0. We assume that u_{fi} follows a normal distribution with mean u and variance σ_u^2. Having set u_{ci} equal to 0, in terms of notation we drop this term and replace u_{fi} by u_i in the remainder of the paper.

We now describe a chain's decision to start franchising. If chain i decides to start franchising in year t, it has to pay a sunk cost ω_{it}. This cost is firm-specific because the owner's time and ability, and the complexity of the business formal, for example, all affect this cost, and these are all firm specific. This decision therefore depends on how the value of entry into franchising, minus the setup cost, compares with the value of waiting.

The value of entry is the expected net present value of all future opportunities after entry into franchising. The expected value of each opportunity τ is

$$\begin{aligned} & E_{\left(\varepsilon_{ci\tau}, \varepsilon_{fi\tau}\right)} \max\left\{\pi_{ci\tau}, \pi_{fi\tau}, 0\right\} \\ = \; & \log\left(\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c\right) + \exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + \boldsymbol{x}_{it}^{(f)}\boldsymbol{\beta}_f + u_i\right) + 1\right) \end{aligned}$$

Given that the expected number of opportunities is m_{it}, the expected value of all opportunities in period t when the firm can franchise is $m_{it}\log\left(\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c\right) + \exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c + \boldsymbol{x}_{it}^{(f)}\boldsymbol{\beta}_f + u_i\right) + 1\right)$.

We assume that $\boldsymbol{x}_{it}$ follows a Markov process. Thus, the value of entry satisfies

$$\begin{aligned} VE_i(\boldsymbol{x}_{it}) &= m_{it}\log\left(\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c\right)+\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c+\boldsymbol{x}_{it}^{(f)}\boldsymbol{\beta}_f+u_i\right)+1\right) \\ &\quad +\delta E_{\boldsymbol{x}_{it+1}|\boldsymbol{x}_{it}} VE_i(\boldsymbol{x}_{it+1}), \end{aligned} \tag{5}$$

where δ is the discount factor. Note that for notational simplicity, we denote the value of entry by $VE_i(\boldsymbol{x}_{it})$ instead of $VE(\boldsymbol{x}_{it},\nu_i,u_i)$ where ν_i and u_i the unobservable components in the opportunity arrival rate and the relative profitability of a franchised outlet.

If chain i has not entered into franchising at the beginning of year t, it can only choose to open a company-owned outlet – or do nothing – when an opportunity arises in year t. The expected value of opportunities in year t is therefore $m_{it}E_{\varepsilon_{ci\tau}}\max\{\pi_{ict},0\} = m_{it}\log\left(\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c\right)+1\right)$. As for the continuation value, note that if the chain pays the sunk cost to enter into franchising next year, it gets the value of entry $VE_i(\boldsymbol{x}_{it+1})$. Otherwise, it gets the value of waiting $VW_i(\boldsymbol{x}_{it+1})$. So the value of waiting this year is

$$\begin{aligned} VW_i(\boldsymbol{x}_{it}) &= m_{it}E_{\varepsilon_{ci\tau}}\log\left(\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c\right)+1\right) \\ &\quad +\delta E_{\boldsymbol{x}_{it+1}|\boldsymbol{x}_{it}}E_{\boldsymbol{\omega}_{it+1}}\max\{VE_i(\boldsymbol{x}_{it+1})-\omega_{it+1},\, VW_i(\boldsymbol{x}_{it+1})\}. \end{aligned} \tag{6}$$

Let $V_i(\boldsymbol{x}_{it})$ be the difference between the value of entry and the value of waiting: $V_i(\boldsymbol{x}_{it}) = VE_i(\boldsymbol{x}_{it}) - VW_i(\boldsymbol{x}_{it})$. Subtracting equation (6) from equation (5) yields

$$\begin{aligned} V_i(\boldsymbol{x}_{it}) &= m_{it}\left[\log\left(\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c\right)+\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c+\boldsymbol{x}_{it}^{(f)}\boldsymbol{\beta}_f+u_i\right)+1\right)-\log\left(\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c\right)+1\right)\right] \\ &\quad +\delta E_{\boldsymbol{x}_{it+1}|\boldsymbol{x}_{it}}E_{\boldsymbol{\omega}_{it+1}}\min\{\omega_{it+1},\, V_i(\boldsymbol{x}_{it+1})\} \end{aligned} \tag{7}$$

In the second part of equation (7),

$$E_{\boldsymbol{\omega}}\min\{\omega,\, V\} = E(\omega|\omega<V)\Pr(\omega<V)+V(1-\Pr(\omega<V)).$$

Therefore, the Bellman equation (7) can be rewritten as

$$\begin{aligned} V_i(\boldsymbol{x}_{it}) &= m_{it}\left[\log\left(\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c\right)+\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c+\boldsymbol{x}_{it}^{(f)}\boldsymbol{\beta}_f+u_i\right)+1\right)-\log\left(\exp\left(\boldsymbol{x}_{it}^{(c)}\boldsymbol{\beta}_c\right)+1\right)\right] \\ &\quad +\delta E_{\boldsymbol{x}_{it+1}|\boldsymbol{x}_{it}}\left[E(\omega_{it+1}|\omega_{it+1}<V_i(\boldsymbol{x}_{it+1}))\Pr(\omega_{it+1}<V_i(\boldsymbol{x}_{it+1}))\right. \\ &\quad \left.+V_i(\boldsymbol{x}_{it+1})(1-\Pr(\omega_{it+1}<V_i(\boldsymbol{x}_{it+1})))\right]. \end{aligned} \tag{8}$$

Chain i starts franchising at the beginning of year t if and only if the difference between the value of entry and the value of waiting is larger than the setup cost, i.e., $V_i(\boldsymbol{x}_{it}) \geq \omega_{it}$. We assume that the entry cost shock ω_{it} follows a log-normal distribution with mean and standard deviation parameters ω and σ_ω. Let $\Phi(\cdot,\sigma_\omega)$ be the distribution function of a standard normal random variable. Then, the probability of entry is given by

$$g(\boldsymbol{x}_{it};\nu_i,u_i) = \Phi\left(\frac{\log V(\boldsymbol{x}_{it};\nu_i,u_i)-\omega}{\sigma_\omega}\right), \tag{9}$$

where we replace $V_i(\boldsymbol{x}_{it})$ by $V(\boldsymbol{x}_{it};\nu_i,u_i)$.

The parameters of the model are estimated by maximizing the likelihood function of the sample. We conclude this section with the description of the log-likelihood function. For each chain i in the data, we observe when it starts in business (denoted by B_i, and treated as exogenous) and when it starts franchising (denoted by F_i). The likelihood of observing F_i conditional on chain i's unobservable component of the arrival rate (ν_i) and its unobservable profitability of opening a franchised outlet (u_i) is

$$p(F_i|\nu_i,u_i)=\prod_{t=B_i}^{F_i-1}\left(1-g(\boldsymbol{x}_{it};\nu_i,u_i)\right)\cdot g(\boldsymbol{x}_{iF_i};\nu_i,u_i).$$

We also observe the number of company-owned outlets (denoted by n_{cit}) and the number of franchised outlets (denoted by n_{fit}) for $t=F_i,...,2006$.[18] Therefore, another component of the likelihood function is the likelihood of observing $(n_{cit},n_{fit};t=F_i,...,2006)$ conditional on chain i's timing of franchising (F_i) and the unobservables (ν_i and u_i):

$$p(n_{cit},n_{fit};t=F_i,...,2006|F_i;\nu_i,u_i). \tag{10}$$

For more than 25% of the chains in the data, the number of outlets decreases at least once during the time period we observe this chain. To explain these negative changes in number of outlets, we assume that an outlet can exit during a year with probability γ. The number of company-owned outlets in year t is therefore

$$n_{cit}=n_{cit-1}-\text{exits}_{cit}+(\text{new outlets})_{cit}, \tag{11}$$

where exits_{cit} follows a binomial distribution parameterized by n_{cit-1} and γ. As explained above, $(\text{new outlets})_{cit}$ follows a Poisson distribution with mean $m_{it}p_{ac}(\boldsymbol{x}_{it},u_i)$ or $m_{it}p_{bc}(\boldsymbol{x}_{it},u_i)$ depending on whether the chain starts franchising before year t or not. Similarly,

$$n_{fit}=n_{fit-1}-\text{exits}_{fit}+(\text{new outlets})_{fit}, \tag{12}$$

where $(\text{new outlets})_{fit}$ follows a Poisson distribution with mean $m_{it}p_{af}(\boldsymbol{x}_{it},u_i)$. The recursive equations (11) and (12) are used to derive the probability (10). See Appendix C for details.

Since our data source is about franchised chains, we only observe a chain if it starts franchising before the last year of our data, which is 2006. Therefore, the likelihood of observing chain i's choice as to when it starts franchising (F_i) and observing its outlets $(n_{cit},n_{fit};t=F_i,...,2006)$ in the sample depends on the density of $(F_i,n_{cit},n_{fit};t=F_i,...,2006)$ *conditional* on the fact that we observe it, i.e., $F_i\leq 2006$:

[18] Since our data source is a survey on franchisors, we only observe the number of outlets of a chain after it starts franchising. The last year of our sample is 2006.

$$\mathcal{L}_i = \frac{\int\int p\left(F_i|\nu_i, u_i\right) \cdot p\left(n_{cit}, n_{fit}; t = F_i, ..., 2006|F_i; \nu_i, u_i\right) dP_{\nu_i} dP_{u_i}}{\int\int p\left(F_i \leq 2006|\nu_i, u_i\right) dP_{\nu_i} dP_{u_i}}. \tag{13}$$

The log-likelihood function is obtained by taking the log and summing up over all chains.

Our estimates of the parameters $\beta_m, \boldsymbol{\beta}_c, \boldsymbol{\beta}_f, m, \sigma_m, u, \sigma_u, \omega, \sigma_\omega$ maximize the log-likelihood function (13). Data on the total number of outlets help us identify the parameters in the arrival rate function and the profitability of a company-owned outlet. For example, suppose chains in states with larger population expand much faster than chains in less populated states. This would mean that population has a large impact on the arrival rate, which would yield a large estimate of the coefficient β_m. For another example, if chains in high-income states (states with large per-capita GSP) grow more slowly than those in low-income states, the coefficient of income in the profitability of an outlet (an element in $\boldsymbol{\beta}_c$) would be negative. Dispersion in the total number of outlets identifies the standard deviation of the arrival rate (σ_m). Similarly, variation in the growth of franchised outlets relative to the growth of company-owned outlets identifies the coefficients related to the relative profitability of a franchised outlet ($\boldsymbol{\beta}_f$). Dispersion in relative growth identifies the variation of the unobserved relative profitability of a franchised outlet (σ_u^2). Given the growth pattern, data on waiting time identifies the distribution of the entry cost, i.e., (ω, σ_ω).

5 Estimation Results

Our estimation results are shown in Table 2. In this table, all estimated parameters are significant except for the coefficient of population, which we included in the arrival rate equation. The estimated parameter for population nonetheless has a positive sign, suggesting that opportunities to open new outlets arise more often for chains in larger markets. Interestingly, the per-capita Gross State Product (per-capita GSP) has a negative impact on the profitability of outlets. This might seem surprising as stores would be expected to be more profitable in markets where income is greater. However, chain stores are typically not high-end stores. As a result, it seems plausible that chain stores would be more valuable in lower-income areas. In addition, high per-capita GSP may proxy for higher costs of operation as real estate and labor costs are likely to be positively correlated with per-capita GSP. This would further reinforce the chains' tendency to grow more in lower-income, and thus lower cost, areas.

Other coefficients all have the expected signs. In particular, our main explanatory variable of interest, collateralizable housing wealth, has a positive effect on the value of opening a franchised outlet relative to opening a company-owned outlet. In other words, when franchisee financial constraints are less binding, namely they have more collateral to put forth, the chains increase their reliance on franchising relative to company ownership. This is in line with the predictions of our simple theoretical model, where franchisee borrowing against their collateral to start their business increases their incentives to work hard and hence the profitability of franchising to the

Table 2: Estimation Results

	parameter	standard error
Log of Opportunity Arrival Rate		
Constant	2.930	0.048
Log(Population)	0.011	0.016
Std. dev.	1.570	0.013
Profitability of a Company-Owned outlet		
Per-capita GSP	-1.750	0.009
Relative Profitability of a Franchised Outlet		
Collateralizable Housing Wealth	0.112	0.002
Capital-labor ratio	-0.022	0.011
Business Products & Services	-0.887	0.073
Restaurants	-0.416	0.053
Home Services	1.800	0.068
Go to Services	-0.245	0.066
Auto Products & Services	-0.172	0.088
Constant (Retailer)	2.510	0.051
Std. dev.	2.100	0.028
Outlet exit rate	0.237	0.001
Log of entry cost		
Mean	12.500	2.270
Extra cost of franchising right away	3.790	1.210
Std. dev.	13.200	3.390

franchisors. The coefficients for the sector dummy variables suggest that the benefit of franchising is greatest for chains providing the types of services that are offered at the home of the consumer. This is very consistent with the agency issues mentioned above, as the types of business that offer services at the consumer's home – such as cleaning services, lawn care services, and so on – are particularly labor intensive. Presumably similar considerations are making franchising particularly valuable for the retailers in our data.

We also find a large and highly significant rate of closure of outlets in our data. It implies that about 24% of all outlets close every year. This is larger than the 15% exit rate documented in Jarmin, Klimek and Miranda (2009) for single retail establishments. Most likely this is in part because our data includes relatively more firms from industries with higher than average exit rates

(e.g. restaurants per their analyses).[19] Also, our data comprises mostly new franchised chains in their first years in franchising. Two things happen to these chains that explain our high exit rate. First, many of them are experimenting and developing their concept while opening establishments. Some of this experimentation, in terms of product as well as location types – e.g. rural, suburban and urban, in strip malls or stand alone, in high or low income areas, and so on – will not pan out, resulting in some establishments being closed down. Second, when chains begin to franchise, they often transform some of the outlets they had established earlier as company outlets into franchised outlets. In our outlet counts, such transfers would show up as an increase in number of franchised outlets, combined with a reduction, and thus exit, of a number of company owned outlets.

To see how well our estimated model fits the entry and the expansion pattern of the chains in the data, we compare the distribution of the waiting time from the data with the same distribution predicted by the model according to a simulation in Figure 3(a). We make a similar comparison for the distributions of the number of company-owned and franchised outlets also in Figures 3(b) and 3(c), respectively.

The left panel of Figure 3(a) shows the distribution of the waiting time in the data while the right panel of Figure 3(a) displays the simulated distribution of the waiting time *conditional on* a chain having started franchising by 2006. Since a chain is included in our data only after it started franchising and the last year of our sample is 2006, this conditional distribution is the model counterpart of the distribution in the data. Comparing the two panels of Figure 3(a), we can see that our estimated model fits the entry decision of chains in the data rather well.

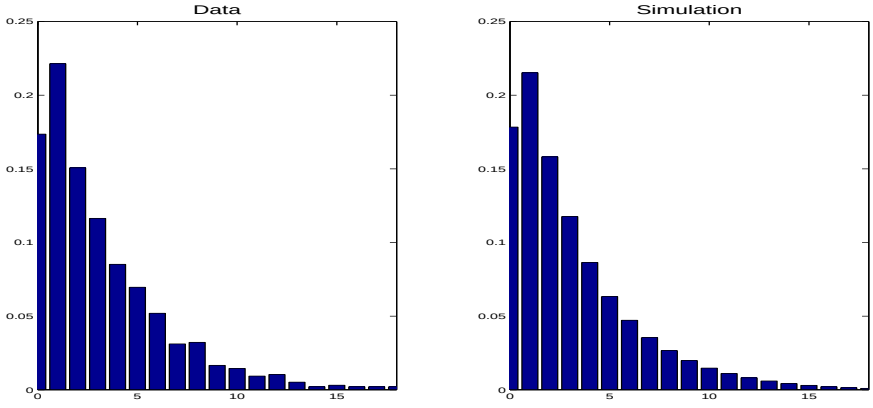
For its part, Figure 3(b) compares the distribution of the number of company-owned outlets in the data (in the left panel) and the distribution of the number of company-owned outlets in the years after a chain starts franchising, and hence also conditional on the chain having started franchising no later than 2006 (see the middle panel).[20] This comparison is the appropriate one to make because we only observe the size of a chain after it starts franchising. Comparing the two figures indicates that our empirical model fits the percentage of chain/years with more than one company-owned outlets well. But the model over-predicts the fraction of chain/years with no company-owned outlets, and under-predicts the fraction with only one company-owned outlets. It does predict the sum of these two fractions pretty well, however. This is probably because our model does not capture a chain's desire to keep at least one company-owned outlet as a showcase for potential franchisees, and for running experiments for new products, for example. Similarly, Figure 3(c) plots the distribution of the number of franchised outlets in the data (on the left) and the model predicted distribution of this number conditional on a chain having started franchising

[19]See also Abrams (2004), who reports on a study conducted by Prof. H.G. Parsa at Ohio State University. Prof. Parsa tracked new restaurants from 1996-1999 and found that 59 percent of them closed within those three years.

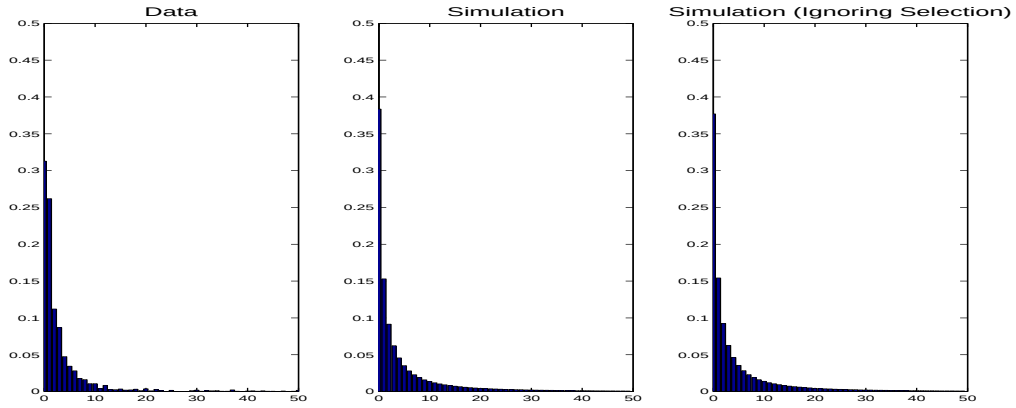
[20]Since there are only a few chain/years with more than 50 company-owned outlets, we truncate the graphs on the right at 50 for readability.

Figure 3: Fit of the Model

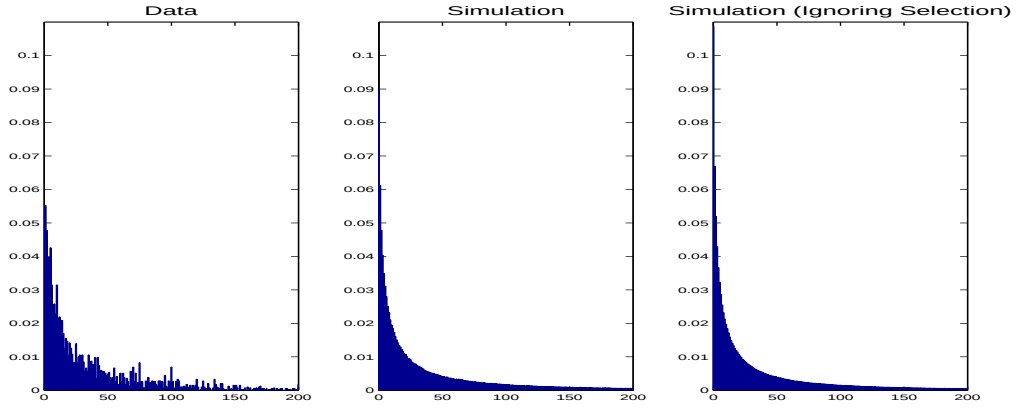
(a) Distribution of Waiting Time: Data vs. Simulation



(b) Distribution of the Number of Company-owned Outlets: Data vs. Simulation



(c) Distribution of the Number of Franchised Outlets: Data vs. Simulation



no later than 2006 (in the middle).[21] The overall fit is good. But, not surprisingly, the distribution predicted by the model is much smoother than that in the data.

We also simulate the distribution of the number of company-owned and franchised outlets when the selection or entry into franchising is ignored. Specifically, in these simulations we take the observed waiting time in the data as exogenously given and ignore the selection issue associated with the decision to enter into franchising. The simulated distributions are shown in the right panels of Figures 3(b) and 3(c). When we compare the middle panel of Figures 3(b) (the simulated distribution of the number of company-owned outlets when selection is considered) and the right panel of the same figure (the simulated distribution when selection is ignored), we can see that these two distributions are very similar. This is probably because two selection effects cancel each other out. On the one hand, chains that enter into franchising quickly tend to grow faster overall either because they are presented with more opportunities to open an outlet or because an outlet of these chains is more likely to be profitable. This selection is indicated by Figure 1. On the other hand, chains that enter into franchising fast are chains for which a franchised outlet is likely to be particularly more profitable than a company-owned outlet. This selection effect is suggested by Figure 2. The latter effect shifts the distribution of the number of company-owned outlets to the left, while the first selection effect shifts the same distribution to the right.

The second selection effect is also consistent with the comparison of the middle panel and the right panel of Figure 3(c) for the number of franchised outlets. The simulated distribution of the number of franchised outlets when the entry decision is incorrectly taken as exogenous (in the right panel) is shifted to the left from the simulated distribution where selection is considered (in the middle panel). This is because when we simulate the distribution in the right panel, we draw the unobservable profitability of a franchised outlet from the unconditional distribution. So even if the draw is not in favor of a chain opening a franchised outlet when an opportunity arrives, the simulated number of franchised outlets corresponding to this draw, which is most likely to be very small, is included to compute the distribution. When selection is taken into account, however, a chain with unfavorable draws may not enter into franchising as early, and therefore it is not included in the computation of the conditional distribution of the number of franchised outlets.

6 Counterfactual Simulations

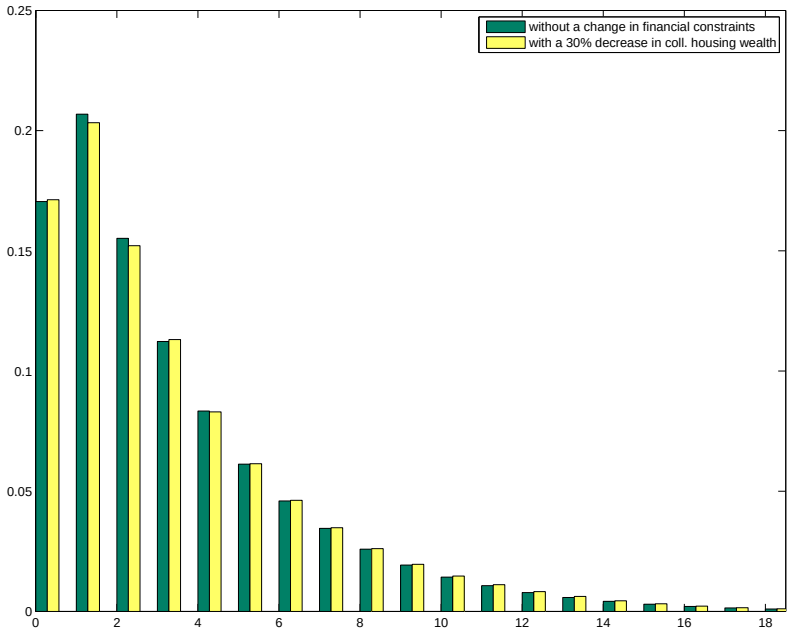
In this Section, we conduct a counterfactual simulation where collateralizable housing wealth is decreased by 30% in all state/years in the data. This exercise serves two purposes. First, it helps us to understand the economic meaning of the estimated effect of collateralizable housing wealth on the extent of franchising and the expansion of chains. Second, it allows us to explore the likely

[21] Similar to 3(b), we truncate the graphs on the right at 200 because there are only a few chain/years with more than 200 franchised outlets.

effect of the reduction in housing values on the growth of small businesses, in this case franchised establishments.

Figure 4 shows the simulated distributions of the waiting time with and without a 30% decrease in local collateralizable housing wealth. We use the simulated distribution without the decrease rather than the empirical distribution directly from the data as the benchmark for two reasons. First, we do not want estimation errors to contribute to the observed differences between the distributions with and without the decrease in collateralizable housing wealth. Second, tightening potential franchisees' financial constraints may not only constrain chain expansion, but it might lead chains to enter into franchising later. To see the latter effect, we need to plot the *unconditional* distribution of the waiting time, which is not observable in the data. In the data, we only observe the distribution conditional on entry into franchising before 2006.

Figure 4: The Effect of Potential Franchisees' Financial Constraints on Chain's Waiting Time

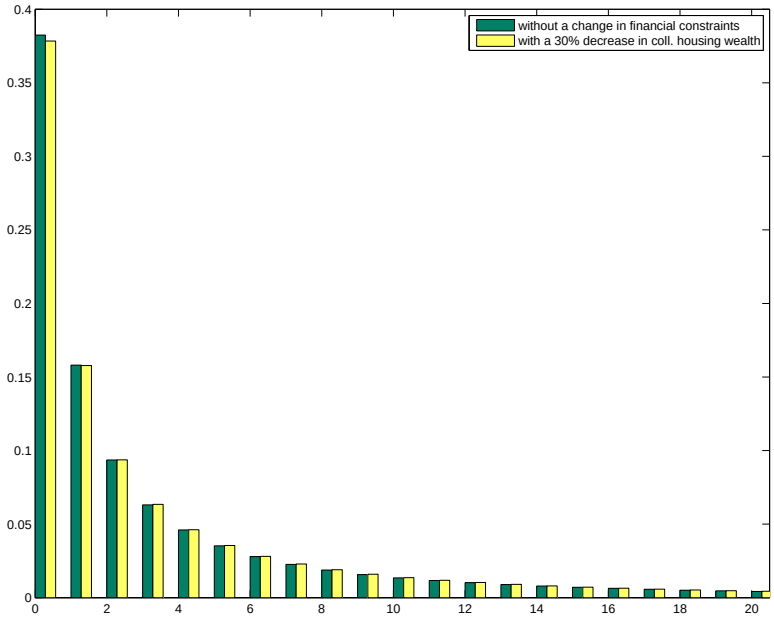


From Figure 4, we can see that firms go into franchising somewhat later with than without the change in franchisee financial constraints, as the percentage of firms that start franchising within 3 years decreases while the percentage of firms that start franchising later increases. These results also suggest that changes in franchisee wealth could make franchising less attractive to chains that might have considered it as a viable option if franchisees with suitable wealth were easier to find. This, however, is beyond the scope of what our simulations can capture explicitly, as the simulations are based on a set of firms that we know chose to franchise by 2006.

Figures 5 and 6 show the distributions of the number of company-owned outlets and franchised

outlets, respectively. The results of our simulations imply that with a 30% decrease in potential franchisees' collateralizable wealth, the number of total outlets of chains five years after they start in business decreases by 2.24 on average (averaged over simulations and the 781 firms in our sample that started in business no later than 2002).[22] In total, these 781 firms would fail to open 1749 outlets with 9946 jobs – according to our data on number of employees per establishment – in the process.[23] Similarly, there are 462 firms in our sample that started franchising no later than 1997. Our simulation indicates that these firms would have 1575 fewer outlets ten years after starting in business (3.41 outlets each on average). The corresponding amount of jobs loss would be 9490.

Figure 5: The Effect of Potential Franchisees' Financial Constraints on the Number of Company-owned Outlets

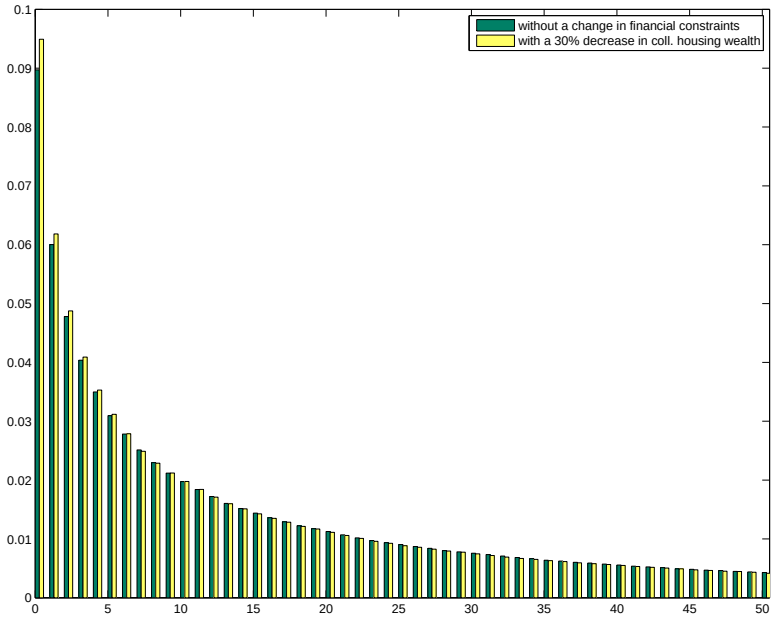


Of course, the franchised firms in our sample are only a subset of all franchisors – they are the chains that started in business after 1984 but before 1997 or 2002, and that started franchising before 2006, and that were included in our data sources. To understand the overall impact of the tightening of franchisees' financial constraints might be, we can use the average percentage changes in the number of outlets five and ten years after a firm starts its business. They are, respectively, 3.1% and 2.2%. Per the 2007 Economic Census, firms involved in franchising had

[22]The average number of outlets five years after a chain starts its business is 29.18 in the data. The simulated counterpart (without any change in collateralizable housing wealth) is 73.47. This much larger average simulated number of outlets arises in part because we have a few firms that grow quite large – much larger than real firms do – in our simulations. Hence the median number of outlets is much smaller and more similar to that in the data.

[23]The jobs numbers also are averaged over simulations. We can simulate the job creation because we observe the typical number of employees needed in an outlet for each chain.

Figure 6: The Effect of Potential Franchisees' Financial Constraints on the Number of Franchised Outlets



more than 450,000 establishments, and accounted for 7.9 million jobs in the U.S. Using the latter figure, and the percentage changes in outlets that we obtain, the predicted number of jobs affected could be as large as 174,000 to 245,000.

7 Conclusion

In this paper, we have shown theoretically and empirically that the entry of a firm into franchising and its growth via franchised relative to company-owned outlets are intrinsically linked. We hope that our empirical model, which accounts for selection into franchising explicitly, might prove useful in other contexts as well. We have also shown that both the growth of franchised chains via company and franchised outlets, and their decision to enter into franchising, depend on the availability of financial resources of potential franchisees. The magnitude of the effects is relatively large, suggesting that financial constraints play an important role for the type of small business owners that franchisors try to attract into their ranks. Finally, while our data, like those that are typically available to study small businesses, only show the net change in number of outlets each year, our model allows us to separately identify both the creation and exit of outlets in the data. Our results show that outlet exit rates are quite high in these types of businesses, higher perhaps than current estimates – which are also high – might suggest.

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Appendix

A A Simple Theoretical Model

Suppose that revenue for a specific chain outlet is given by $\theta + e$. The variable θ captures both the quality of the idea of the chain, the local conditions for that specific opportunity and a profit shock. It is random and drawn from some distribution $F(\theta)$ with decreasing hazard rate $\frac{f(\theta)}{F(\theta)}$. Let e be the effort level of the manager of the outlet. We assume that a minimum level of effort e_0 can be induced even for an employed manager. This could be thought of as an observable component of effort or a minimum standard that can be monitored at low cost. The cost of effort is given by the cost function $\Psi(e)$, which is increasing and strictly convex with $\lim_{e\to\infty} \Psi'(e) = \infty$ and $\Psi(e) > 0$ for any $e > 0$.

The startup of an outlet requires capital of I. This capital can either come from internal funds or borrowed from a bank in form of a debt contract. Banks compete a la Bertrand in the terms of the contract, (R, C), where R denotes the repayment and C is the collateral that the bank receives in case a debtor defaults on the payment of R. For simplicity of exposition we assume that the bank does not receive any other payment beyond C in the case of default.[24] There are at least two banks.

Consider first a managerial outlet, i.e. a company-owned outlet. Suppose an employed manager can only be paid a fixed wage so that it is impossible to induce a higher effort level than e_0 for a company-owned outlet. We normalize the outside option of an employed manager to zero, so that the wage would be set at $\Psi(e_0)$. Then, this outlet makes positive profits if and only if $E\{\theta\} + e_0 - \Psi(e_0) > I$. Since Bertrand competition drives the cost of the investment down to I and there is no incentive issue, a company-owned outlet is profitable to open whenever it is efficient to open it. Therefore, there is no difference in this case whether there is internal or external financing.

Now consider a franchised outlet. We assume that $1 > \Psi'(e_0)$, so that there is value to inducing more effort than in a managerial unit, so that opening a franchisee owned outlet would generally be efficient. The potential franchisee has collateralizable wealth W which we assume to be mostly housing, so that $C \leq W$. We assume that this wealth is generally not sufficient to fully collateralize the debt so that a bank will face default risk. The franchisee and the banks sign a contract specifying the repayment and the collateral. Based on the contract, the franchisee decides on the amount of effort exerted. For simplicity we assume that there is no discounting. Let s be the revenue share of the franchisor, which is fixed at the time of entry into franchising. The franchisee will default if and only if what she earns from the outlet is smaller than the repayment, i.e.

$$(1 - s)(\theta + e) < R \tag{A.14}$$

The critical state of the world below which default occurs is $\theta^* = \frac{R}{1-s} - e$. Under a standard debt contract with collateral, the payoff of the franchisee can be written as:

$$\int_{-\infty}^{\infty} [(1 - s)(\theta + e) - R]\, dF(\theta) + F(\theta^*)[R - C] - \Psi(e) \tag{A.15}$$

For any given R and s, the franchisee maximizes (A.15) with respect to e. It turns out that for equilibrium analysis it is easier to use the change of variable $e = \frac{R}{1-s} - \theta^*$ and write the franchisee's maximization problem equivalently as:

$$\pi^*(s, C) \equiv \max_{\theta^*} \int_{-\infty}^{\infty} [(1 - s)(\theta - \theta^*)]\, dF(\theta) + F(\theta^*)\,[R - C] - \Psi(\frac{R}{1 - s} - \theta^*) \tag{A.16}$$

[24] Note that this is not quite as in standard debt contracts because the bank does not obtain the residual revenue in the case of default. We assume that the franchisee can walk away with these revenues before the bank can get hold on these assets. (We will add a discussion on the effect that the alternative assumption).

The franchisee earns the surplus above the critical θ^* in all of the states. With probability $F(\theta^*)$ he is bankrupt and does not have to pay R but has to give up the collateral C. This maximization problem yields the first order condition:

$$-(1-s)+f(\theta^*)[R-C]+\Psi'(\frac{R}{1-s}-\theta^*)=0 \tag{A.17}$$

Since $f(\theta^*)+\Psi''(\frac{R}{1-s}-\theta^*)/(1-s)>0$, standard comparative statics results imply that the schedule $\theta_F^*(R)$ that is defined by (A.17) is strictly upward sloping and continuous up to, possibly, a number of upward jumps. Intuitively, the higher R the greater the likelihood that the franchisee goes bankrupt.

Bertrand competition implies that banks have to just break even in equilibrium:

$$R-F(\theta^*)[R-C]=I \tag{A.18}$$

Since $C \leq W < I$, it follows that $R > C$. Note that by the implicit function theorem (A.18) generates a continuous and monotonically increasing schedule $R_B(\theta^*)$ for any C. This simply reflects that the higher the probability of default, the more adverse the terms of the contract need to be for given collateral for a bank to break even.

Proposition 1 *There exists a unique equilibrium of the game. Either there is no contracting in equilibrium or the equilibrium contract has $C = W$.*

Proof. Fix C at its equilibrium value. Now note that the break even constraint for the bank can only be satisfied for $R > I$. However, for θ^* small enough, (A.17) can only be satisfied if $R < 0$. Hence, there exists some $\hat{\theta} > -\infty$ such that for all $\theta^* < \hat{\theta}$ the (A.17) schedule is strictly below the (A.18) schedule, i.e. $R_F(\theta^*) = \theta_F^{*-1}(R) < R_B(\theta^*)$ for all $\theta^* < \hat{\theta}$ where an inverse exists. We now show that $\theta^{**} = \sup\hat{\theta}$ is the unique equilibrium critical default state. By the fact that $R_F(\theta^*) = \theta_F^{*-1}(R) < R_B(\theta^*)$ and that both schedules are strictly increasing it follows that the lowest θ^* at which the schedules intersect is θ^{**}. Furthermore $R_B(\theta^*)$ intersects $R_F(\theta^*)$ from above. Hence there exists some $\theta^+ > \theta^{**}$ such that $R_F(\theta^*) - F(\theta^*)[R_F(\theta^*) - C] > I$ for all $\theta^* \in (\theta^{**}, \theta^+)$. Suppose there would exist an equilibrium with $R > R_F(\theta^{**})$. Then a bank would make zero profits in that equilibrium. However, it could reduce the repayment to $R_F(\theta^{**}) + \varepsilon$ and make strictly positive profits, a contradiction.

To complete the proof we need to show that $C = W$. Note that the schedule $R_B(\theta^*)$ shifts down as C is increased and the schedule $R_F(\theta^*)$ shifts up as well. Both shifts lead to a lower intersection for both θ^{**} and R, so that $\theta^{**}(C)$ and $R(C)$ are both strictly decreasing in C. Now note that from (A.18)

$$\frac{dR}{dC} = \frac{d}{dC}\{F(\theta^*)[R-C]\} \tag{A.19}$$

Rewriting (A.17) as

$$(1-s) - \frac{f\left(\theta^{**}(C)\right)}{F(\theta^{**}(C))} F(\theta^*)\left[R(C) - C\right] - \Psi'(e(C)) = 0 \tag{A.20}$$

it follows that

$$\frac{d}{d\theta^*}\frac{f\left(\theta^{**}(C)\right)}{F(\theta^{**}(C))}\frac{d\theta^*}{dC} - \frac{d}{dC}\left\{F(\theta^*)\left[R - C\right]\right\} - \Psi''(e(C)\frac{de}{dC} = 0 \tag{A.21}$$

Now note that the first term is positive by the assumption on the hazard rate and the result that $\frac{d\theta^*}{dC} < 0$. The second term is positive by (A.19) and the fact that $\frac{dR}{dC} < 0$. Since $\Psi''(e) > 0$ it follows that $\frac{de}{dC} > 0$. But then

$$\frac{\partial \pi^*}{\partial C} = \left[(1-s) - \Psi'(e)\right]\frac{de}{dC} > 0 \tag{A.22}$$

where the last inequality follows from (A.17). □

From this analysis almost directly the comparative statics in a number of variables:

Proposition 2 *The effort and profits of the franchisee strictly increase with an increase in her wealth W, her revenue share $(1-s)$, a first order dominant shift in the distribution of θ, and a decrease in the capital requirement to open an outlet I.*

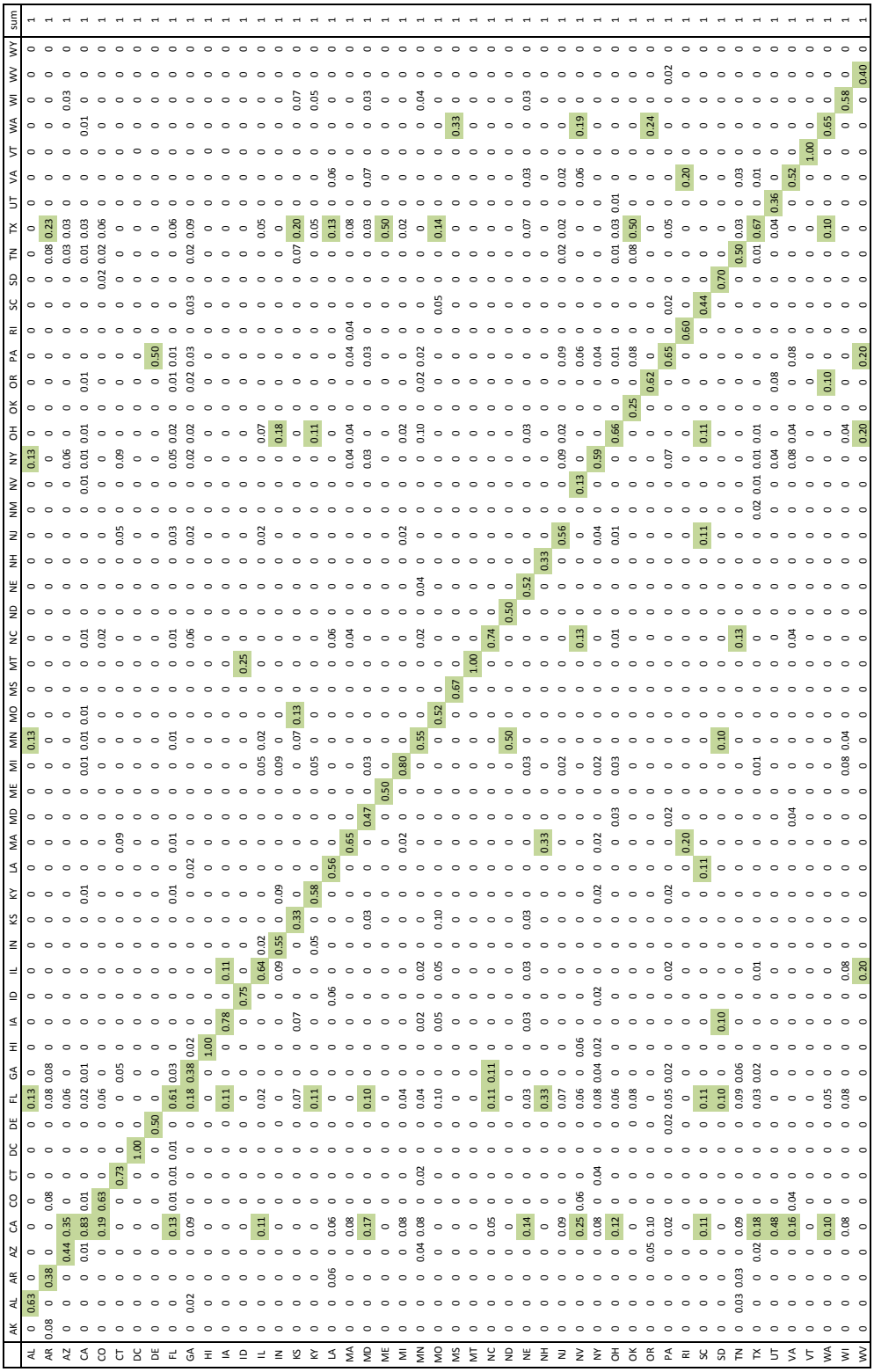
Proof. The first part of the proof follows from the second half of the proof of proposition 1. An increase in $(1-s)$ directly increases the incentive for effort and indirectly increases it by reducing R, which will increase effort further. A first order dominant shift in the distribution of θ directly decreases the probability of default and through this raises effort and reduces R, which raises effort further. A decrease in I, reduces R and through this effect increases effort. □

Combining these results we get:

Proposition 3 *For every triple $(F(\cdot), (1-s), I)$, there exists a unique $\bar{W}$, such that the franchisor makes strictly greater profits opening a franchisee owned outlet than opening a company-owned outlet if and only if $W > \bar{W}$.*

Proof. Omitted. □

B The Weight Matrix Used in Constructing Values for Macroeconomic Variables that are Relevant to each Chain



For a chain whose home state is AL, for example, its macroeconomic variable is the weighting sum of the macroeconomic variable in the 51 states where the weights are given by the first row.

C Details on the Log-likelihood Function

In this Section, we derive the log-likelihood function (13), which consists of three components: $p\left(F_i|\nu_i,u_i\right)$, $p\left(F_i\leq 2006|\nu_i,u_i\right)$ and $p\left(n_{cit},n_{fit};t=F_i,...,2006|F_i;\nu_i,u_i\right)$. As described in Section 4, the likelihood of observing F_i conditional on chain i's unobservable arrival rate and profitability of opening a franchised outlet (ν_i,u_i) is

$$p\left(F_i|\nu_i,u_i\right)=\prod_{t=B_i}^{F_i-1}\left(1-g\left(\boldsymbol{x}_{it};\nu_i,u_i\right)\right)\cdot g\left(\boldsymbol{x}_{iF_i};\nu_i,u_i\right).$$

The likelihood of observing chain i in the sample, i.e., $F_i\leq 2006$, is thus the sum of the probability that chain i starts franchising right away $(F=B_i)$, the probability that it starts one year later $(F=B_i+1)$, ..., the probability that it starts before 2006, i.e.,

$$p\left(F_i\leq 2006|\nu_i,u_i\right)=\sum_{F=B_i}^{2006}p\left(F|\nu_i,u_i\right).$$

To derive the likelihood of observing the growth path $(n_{cit},n_{fit};t=F_i,...,2006)$ of chain i conditional on its timing of franchising, note that the number of company-owned outlets in year t is given by equation (11), copied below:

$$n_{cit}=n_{cit-1}-\text{exits}_{cit}+\left(\text{new outlets}\right)_{cit},$$

where exits_{cit} follows a binomial distribution parameterized by n_{cit-1} and γ; and $\left(\text{new outlets}\right)_{cit}$ follows a Poisson distribution with mean $m_{it}p_{ac}\left(\boldsymbol{x}_{it},u_i\right)$ or $m_{it}p_{bc}\left(\boldsymbol{x}_{it},u_i\right)$ depending on whether the chain starts franchising before year t or not. Given that the mixture of a Poisson distribution and a binomial distribution is a Poisson distribution[25] and the sum of two independent Poisson random variables follows a Poisson distribution, n_{cit} follows a Poisson distribution with mean $\sum_{\tau=B_i}^{t}m_{i\tau}p_c\left(\boldsymbol{x}_{i\tau},u_i\right)\left(1-\gamma\right)^{t-\tau}$ where $p_c\left(\boldsymbol{x}_{i\tau},u_i\right)=p_{cb}\left(\boldsymbol{x}_{i\tau},u_i\right)$ for $\tau<F_i$ and $p_c\left(\boldsymbol{x}_{i\tau},u_i\right)=p_{ca}\left(\boldsymbol{x}_{i\tau},u_i\right)$ for $\tau\geq F_i$. The likelihood of observing n_{cit} in the year the chain starts franchising (i.e. in the first year that we can observe this chain in the data) conditional on it starting franchising in year F_i is therefore

$$p_{n_{cit}|F_i}\left(\nu_i,u_i\right)=\Pr\left(n_{cit};\sum_{\tau=B_i}^{t}m_{i\tau}p_c\left(\boldsymbol{x}_{i\tau},u_i\right)\left(1-\gamma\right)^{t-\tau}\right)\text{ for }t=F_i.$$

For subsequent years $(t=F_i+1,...,2006)$, we need to compute the likelihood of observing n_{cit} conditional on F_i as well as n_{cit-1}. According to equation (11), this conditional probability is the

[25] If X follows a binomial distribution with parameters (N,p) and N itself follows a Poisson distribution with mean m, then X follows a Poisson distribution with mean mp. In equation (11), $n_{oit-1}-\text{exits}_{oit}$ follows a binomial distribution with parameters n_{oit-1} and $1-\gamma$.

convolution of a binomial distribution ("$n_{cit-1}-\text{exits}_{cit}$" follows a binomial distribution with parameters n_{cit-1} and $1-\gamma$) and a Poisson distribution ($(\text{new outlets})_{cit}$ follows a Poisson distribution with mean $m_{it}p_{ac}(\boldsymbol{x}_{it}, u_i)$):

$$\begin{aligned} & P_{n_{cit}|n_{cit-1},F_i}(\nu_i, u_i) \\ = & \sum_{Y=0}^{n_{cit-1}} \Pr(Y|n_{cit-1}; 1-\gamma) \Pr\left((\text{new outlets})_{cit} = n_{cit} - Y; m_{it}p_{ac}(\boldsymbol{x}_{it}, u_i)\right). \end{aligned}$$

However, when n_{cit-1} is not observable but n_{cit-2} is, we need to compute $P_{n_{cit}|n_{cit-2},F_i}$. Note that $n_{cit} = n_{cit-2} - \text{exits}_{cit-1} + (\text{new outlets})_{cit-1} - \text{exits}_{cit} + (\text{new outlets})_{cit}$ can be rewritten as

$$\begin{aligned} & \text{outlets in } n_{cit-2} \text{ that do not exit before } t \\ + \quad & \text{new outlets in } t-1 \text{ that do not exit before } t \\ + \quad & \text{new outlets in } t, \end{aligned}$$

where "outlets in n_{cit-2} that do not exit before t" follows a binomial distribution with parameters $(n_{cit-2}, (1-\gamma)^2)$, "new outlets in $t-1$ that do not exit before t" follows a Poisson distribution with mean $m_{it}p_{ac}(\boldsymbol{x}_{it-1}, u_i)(1-\gamma)$ and "new outlets in t" follows a Poisson distribution with mean $m_{it}p_{ac}(\boldsymbol{x}_{it}, u_i)$. Therefore,

$$\begin{aligned} & P_{n_{cit}|n_{cit-2},F_i}(\nu_i, u_i) \\ = & \sum_{Y=0}^{n_{cit-1}} \Pr\left(Y|n_{cit-1}; (1-\gamma)^2\right) \Pr\left((\text{new outlets})_{cit} = n_{cit} - Y; m_{it}p_{ac}(\boldsymbol{x}_{it-1}, u_i)(1-\gamma) + m_{it}p_{ac}(\boldsymbol{x}_{it}, u_i)\right). \end{aligned}$$

The conditional probabilities $p_{n_{fit}|F_i}(\nu_i, u_i)$, $P_{n_{fit}|n_{fit-1},F_i}(\nu_i, u_i)$ and $P_{n_{fit}|n_{fit-2},F_i}(\nu_i, u_i)$ can be computed analogously. Since Poisson events that result in company-owned and franchised outlet expansions are independent events (because Poisson events are independent), the likelihood of observing chain i's growth path is

$$\begin{aligned} & p(n_{cit}, n_{fit}; t = F_i, ..., 2006|F_i; \nu_i, u_i) \\ = & p_{n_{ciF_i}|F_i}(\nu_i, u_i) \cdot \prod_{t=F_i+1}^{2006} P_{n_{cit}|n_{cit-1},F_i} \cdot p_{n_{fiF_i}|F_i}(\nu_i, u_i) \cdot \prod_{t=F_i+1}^{2006} P_{n_{fit}|n_{fit-1},F_i} \end{aligned}$$

and when the observation of a year is missing (for example, in 1999 and 2002 when the data were not collected), we replace $P_{n_{cit}|n_{cit-1},F_i}$ and $P_{n_{fit}|n_{fit-1},F_i}$ by $P_{n_{cit}|n_{cit-2},F_i}$ and $P_{n_{fit}|n_{fit-2},F_i}$.